

Project 3.9. Study of nanoviscosity changes during cell death

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ICP PAS Group: Soft Condensed Matter Group

www: <http://groups.ichf.edu.pl/holyst>

Background:

The project aims to study the process of death from the physical point of view and correlate biological observations with physical phenomena occurring inside cells. The main goal of the research is to prove the hypothesis, that programmed cell death involves dramatic hindrance of intracellular transport. This will be achieved by a full analysis of intracellular viscosity – and therefore transport – at different stages of cell death. Two types of cell death will be studied: apoptosis and necroptosis. During the project a broad range of length scales and timescales of intracellular motion will be taken into account to provide the fullest possible picture of cell death-associated physical changes of intracellular architecture. Experiments will be performed using well established methods like FCS (Fluorescence Correlation Spectroscopy) and RICS (Raster Image Correlation Spectroscopy), as well as novel BiWEC method (Bin Width-dependent Event Count) – the complimentary to FCS method dedicated to slow motions. All analytical methods used in this project will require fluorescent tracers, thus autofluorescence of the cell and its changes during cell death will be of special focus during the project. The prospect goal of the research will be discovery of a physical marker characteristic for apoptosis and/or necroptosis and preceding their morphological symptoms. In the future, such a marker can be used for development of a label-free cell viability assay.

Aim:

The PhD student will be involved in interdisciplinary activities including: performance of advanced microscopy and spectroscopy experiment (confocal microscopy, fluorescence correlation spectroscopy), preparation of biological samples (cell culture techniques), and data processing. Great emphasis will be placed on the development and validation of analytical methods.

Requirements:

We are looking for motivated candidates who are able to work on interdisciplinary topics at the edge of chemistry, biology and physics. Candidates should possess strong manual skills, analytical skills and ability to think outside the box.

Specific:

- MSc in Biophysics, Chemistry, Physics, Biology, Biotechnology (or related fields).
- experience/interest in topics related to the project.
- ability to read and analyze scientific publications.
- an additional advantage will be experience in fluorescence correlation spectroscopy, biochemistry, analytical chemistry or molecular biology.
- ATTENTION: Parallel recruitment is ongoing for the additional stipend for this position: see <http://ichf.edu.pl/IChF-job.html>, Recruitment No 043-2020.